

Rethinking colostrum feeding: spoiler alert, it's all about total IgG's

Dr. Liz Cox

Calf Milk Calculator

High Plains Dairy Conference, March 2026

Goal is to provide 300g IgG in the first 24 hours

What we need to Rethink

1. Calf serum benchmarks
2. Colostrum Brix benchmark for first feeding
3. Volume given in the first feeding
4. Always offer a second feeding



Our Beef Cow Cousins

- Beef cows make 500-1,000g IgG in first 12-24 hours of life
- After nursing colostrum from the cow, beef calf serum IgG is **50g/L**
- In beef calves, serum <24 g/L IgG associated with negative health outcomes



- What is the cutoff we traditionally use for failure of passive transfer?

<10 g/L IgG

Do we want to pass with a D+ or
pass with an A?

Lombard Scale for Calf Total Serum Protein

Passive Transfer Category	Serum IgG g/L	Total Serum Protein g/dL	Goal for your calf population
Excellent	≥ 25	≥ 6.2	≥ 40%
Good	18-24.9	5.8-6.1	30%
Fair	10.0-17.9	5.1-5.7	20%
Poor	<10	<5.1	10%
	Measured in a lab	Measure on farm	

Let's Strive for an A, not just a pass

- The traditional calf serum IgG $<10\text{g/L}$ failure of passive transfer benchmark associated with mortality
- Higher serum IgG levels have additional benefits
 - Decreased morbidity
 - Ex. Calves with $>15\text{ g/L}$ lower incidence of pneumonia
 - ADG preweaning and postweaning
 - Ex. Calves with $\geq 25\text{ g/L}$ gained 0.8 pound/day more preweaning
- **Excellent (A) is $\geq 25\text{g/L}$**



Higher Serum IgG's → Better Lung Health

Total Serum Protein g/dL	# calves with this TP	# calves in this group with Lung Score ≥ 3
≥ 6.2	236 (44.8%)	88 (37.3%)
5.8-6.1	145 (27.5%)	67 (46.2%)
5.1-5.7	125 (23.8%)	74 (59.2%)
<5.1	21 (4%)	16 (76.2%)

- Dairy in WI
- 527 calves
- Lung ultrasound preweaning
 - Only the Excellent category showed statistical reduction in pneumonia
- Other observation – 33% calves had evidence of pneumonia on lung ultrasound preweaning

Rethinking Calf Serum Benchmark:

Goal of ≥ 5.8 TSP for 70% or more of your calves

What does a 22% Brix mean?

Colostrum

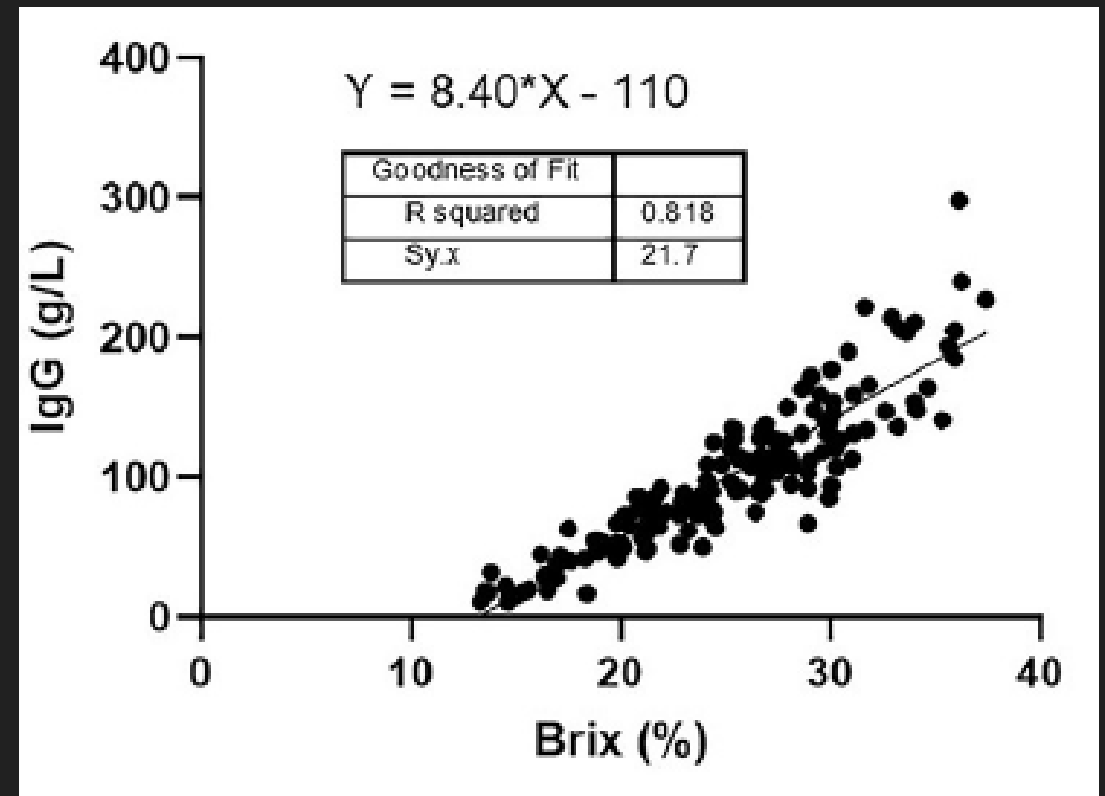
- 22% Brix → approximately 50 g/L IgG
 - 4 L would deliver 200g IgG
- We want to deliver 300g IgG in the first 24 hours



% Brix Provides an Estimation of IgG

- 182 colostrum samples
- 4 different dairies

Brix	Minimum IgG g/L
30%	100
25%	75
22%	50
19%	25



Dairy Cows Can Make Good Colostrum

- 5,200 cow dairy
- Colostrum harvested twice a day
- July – October
- Avg 55 day dry period

IgG concentration in the colostrum

Parity	Avg IgG g/L	Number of cows
1	84.3	201
2	84.2	148
3	117.9	113
≥4	139.1	174

Dairy Cows Can Make Good Colostrum

- 5,200 cow dairy
- Colostrum harvested twice a day
- July – October
- Avg 55 day dry period

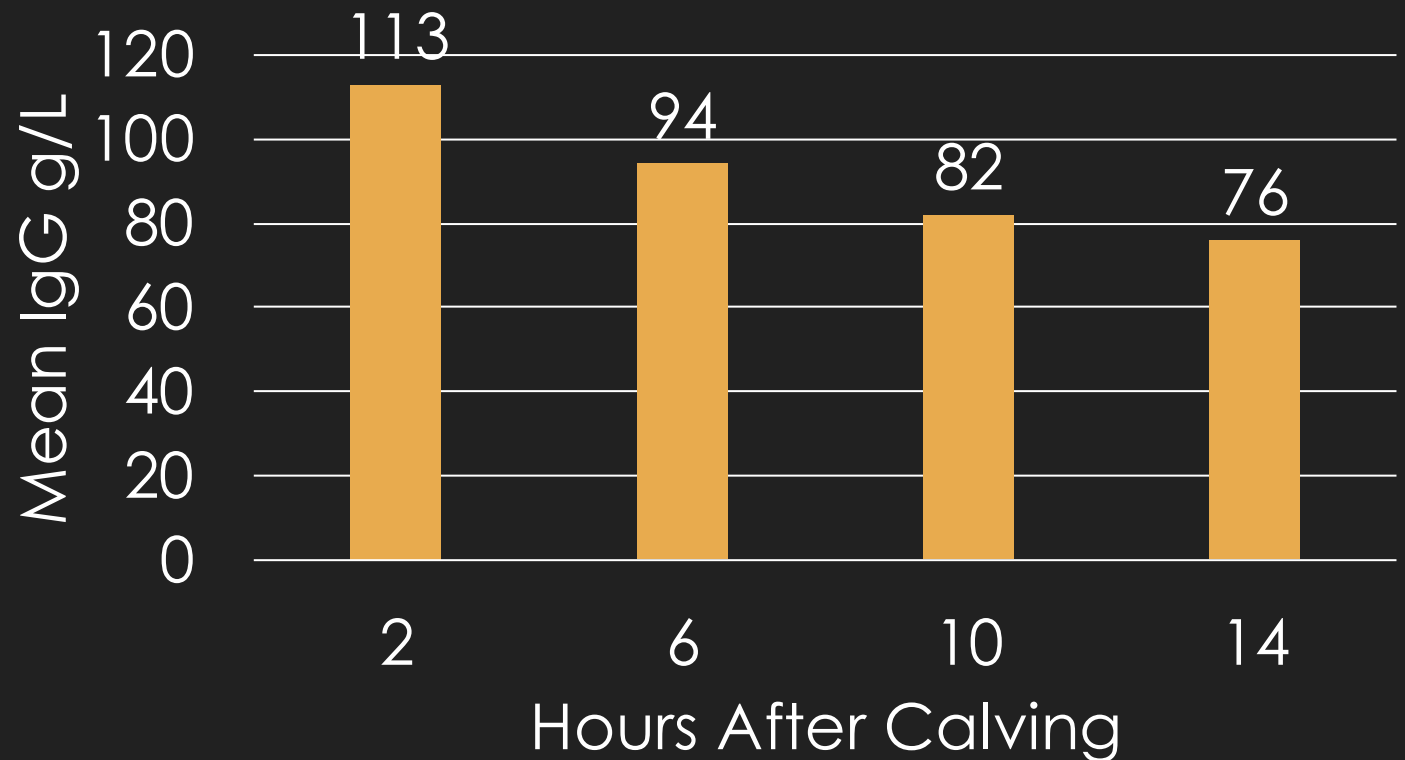
Relationship between Brix
and IgG

Brix	IgG g/L
21%	<50
24%	≥100

Colostrum Quality Impacted by When it is Harvested



Impact of Delayed Colostrum Harvest

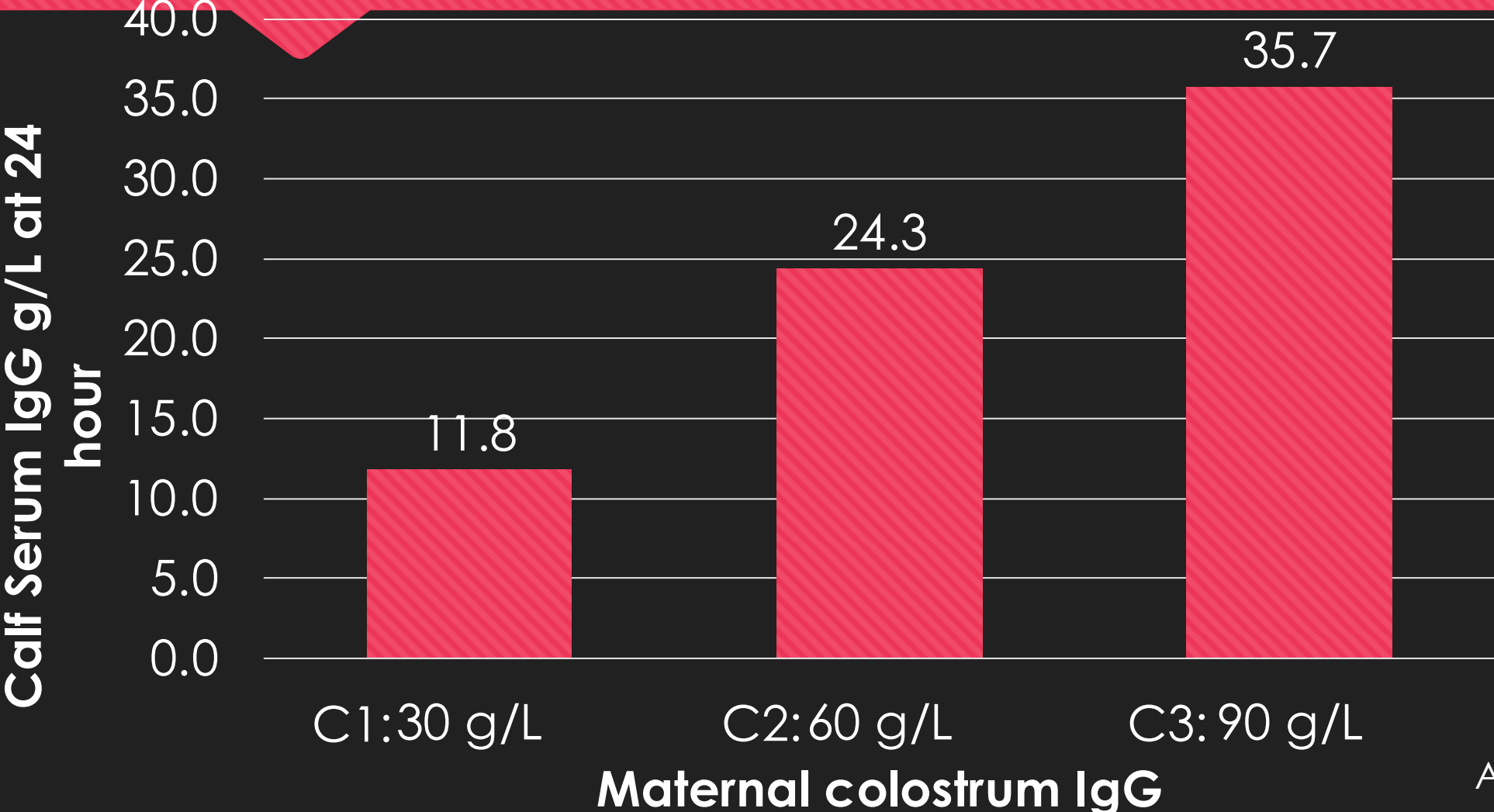


As We Feed More IgG, Calves Absorb More

- 80 male Holstein calves
- Fed 3.8L of colostrum with different IgG concentrations

Group	Colostrum [IgG]	Total IgG fed
C1	30 g/L	114 g
C2	60 g/L	228 g
C3	90 g/L	342 g

As We Feed More IgG, Calves Absorb More

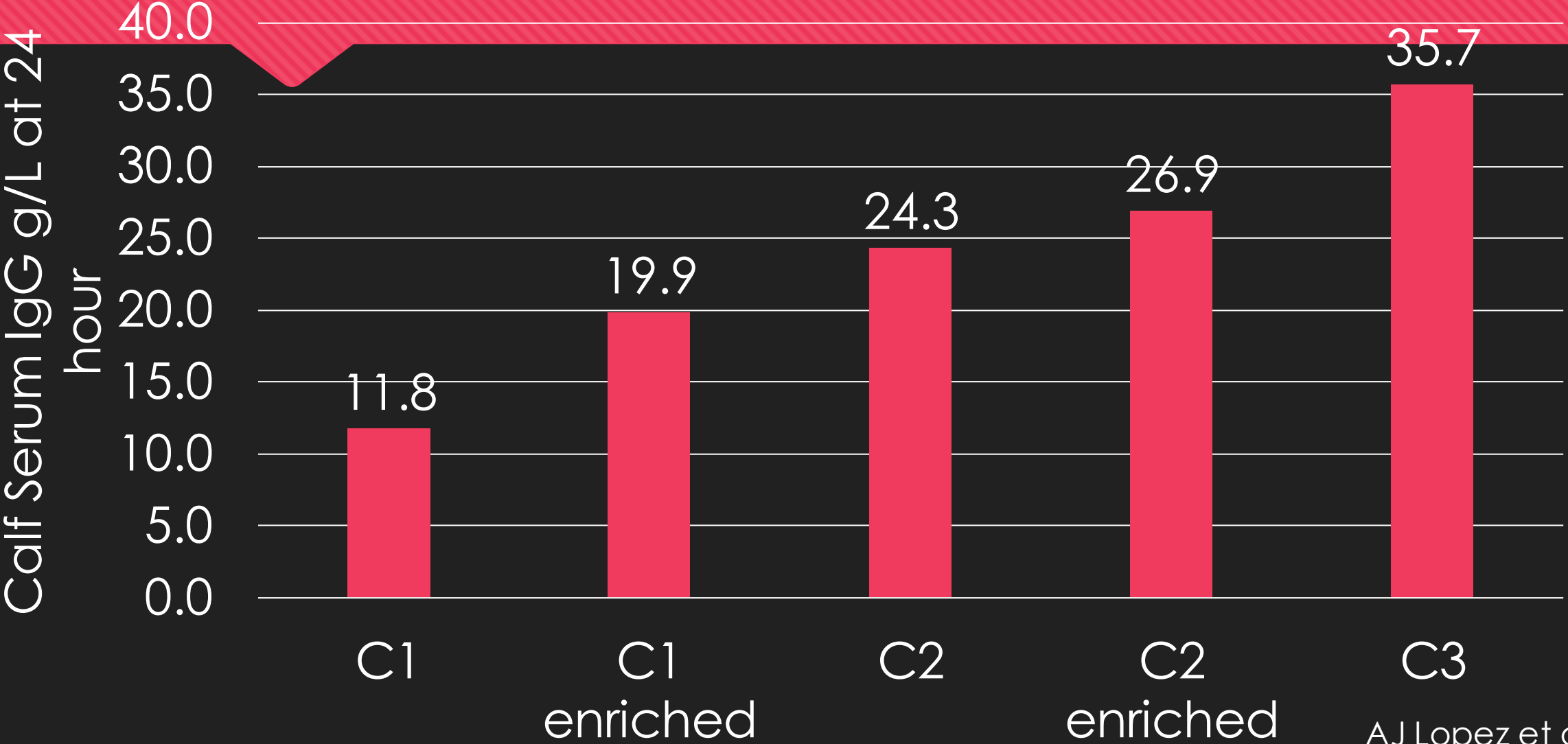


As We Feed More IgG, Calves Absorb More

- Also had 2 enriched colostrum groups
- Added colostrum replacer to enrich the low quality to medium quality and the medium quality to high quality

Group	Colostrum [IgG]	Total IgG fed
C1	30 g/L	114 g
C1 enriched	60 g/L	228 g
C2	60 g/L	228 g
C2 enriched	90 g/L	342 g
C3	90 g/L	342 g

As We Feed More IgG, Calves Absorb More



Consideration when Enriching Colostrum

- Enrichment will increase osmolality
- High osmolality fluid in the abomasum **delays** abomasal emptying
 - Inflammation of abomasal mucosa
- IgG absorption happens in the small intestine

Group	Osmolality mOsm/kg
C1	302
C1 enriched	518
C2	331
C2 enriched	613
C3	339

Abomasal Inflammation



Rethinking colostrum Brix benchmark for first feeding:

Brix $\geq 25\%$ for the first feeding

Background on Volume of Feeding

- Why 1 gallon of 22% Brix?

Historical Goals

- 10% BW
- 200g IgG
 - 22% Brix is ≈ 50 g/L IgG
- New goal is 300g IgG in first 24 hr



Volume Given in the First Feeding

We need to reduce volume for 2 big reasons

1. Efficiency of absorption
2. Calves too full → colic, acidosis, abomasal ulcers, regurgitation, aspiration, pneumonia, refusal to drink next meals...



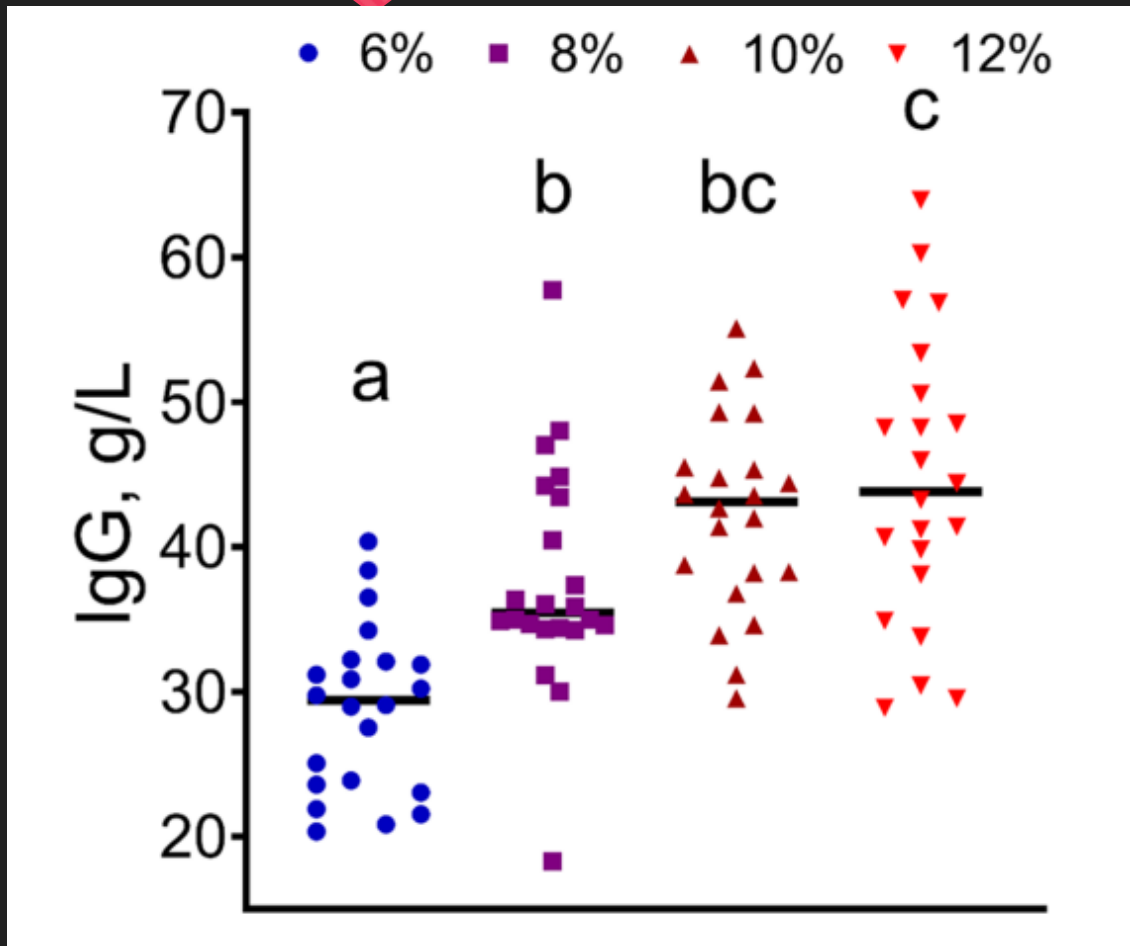
Efficiency of IgG Absorption

- 88 female Holstein calves in 4 groups
- Fed colostrum via tube at different percentages of BW
- Pooled colostrum → Brix 24.2%, IgG 86.7 g/L

BW %	Avg L of colostrum fed	Avg Total g IgG fed
6%	2.3 L	215
8%	3.1 L	286
10%	4.0 L	354
12%	4.8 L	429

Efficiency of IgG absorption

Calf serum sample taken 24 hours after colostrum feeding

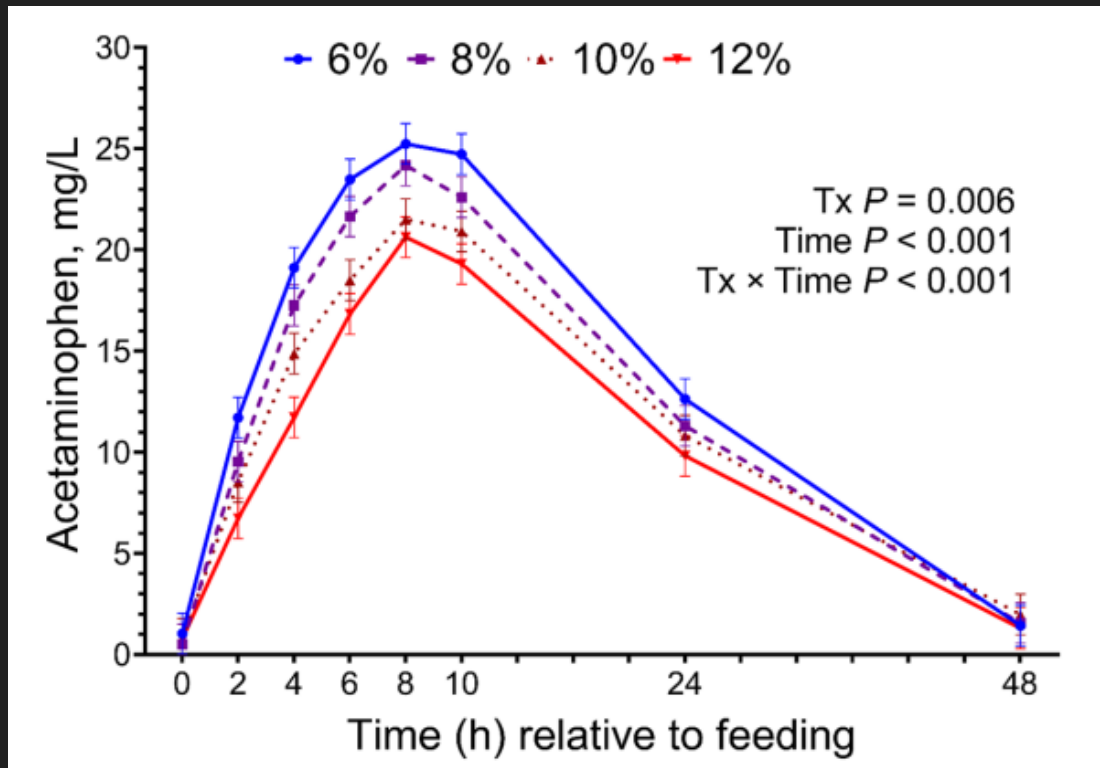


BW %	Avg Serum IgG g/L
6%	28.8
8%	37.4
10%	41.1
12%	43.4

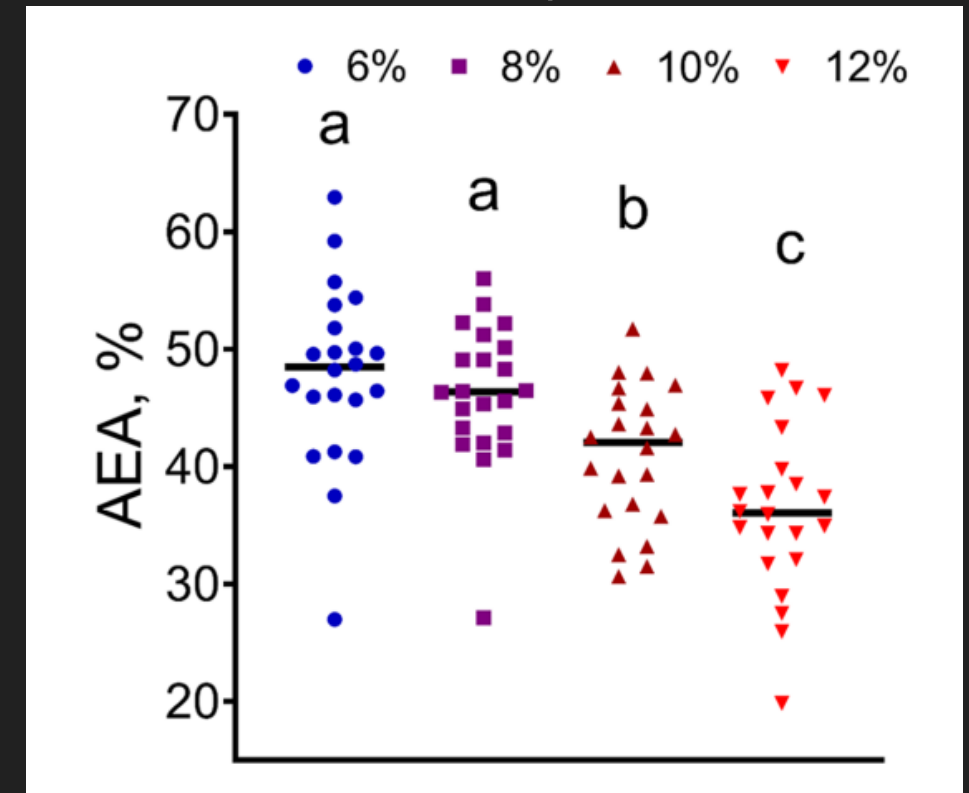
No statistical difference in serum IgG in calves fed 8% and 10% of BW

Efficiency of IgG absorption

This study also evaluated abomasal emptying to help understand the efficiency of IgG absorption



AEA: apparent efficiency of absorption



Efficiency of IgG Absorption

- Calves fed 10% and 12% of BW had significant decrease in efficiency of absorption
- As volume of colostrum meal increased, **gastric emptying rate slowed**
- They also observed calves' behavior after colostrum feeding
 - Lying position, walking, standing, kicking, vocalizing



Let's do the Math on BW%

9 pounds/gallon colostrum

Calf Weight

2L

3L

4L

60 pounds

7.5% BW

11% BW

15% BW

90 pounds

5% BW

7.5% BW

10% BW



Weight of colostrum can range from 8.5-9.4 pounds per gallon (4L)

Volume Given in the First Feeding

- Size of GI organs at birth
 - Rumen: 0.8 – 1.6 L
 - Abomasum: 2 – 4 L

RUMEN GROWTH: AN AMAZING TRANSFORMATION



At birth, the rumen is the size of a softball. The rumen grows to the size of a 40 gallon vat when mature.



In the first 8 weeks of life, the rumen increases in size by 150% to become roughly the size of a plastic grocery bag—large enough to fit two 2-liter bottles.



From 8–24 weeks of age, the rumen volume doubles 5 times.



Where does the colostrum go?

When We Tube Feed Colostrum

- Tubed into the rumen, but the rumen can't hold $>1.6L$
 1. Flows into the abomasum
 2. Regurgitation \rightarrow aspiration
- Colostrum/milk in the rumen ferments \rightarrow acidosis, bloating, GI stasis



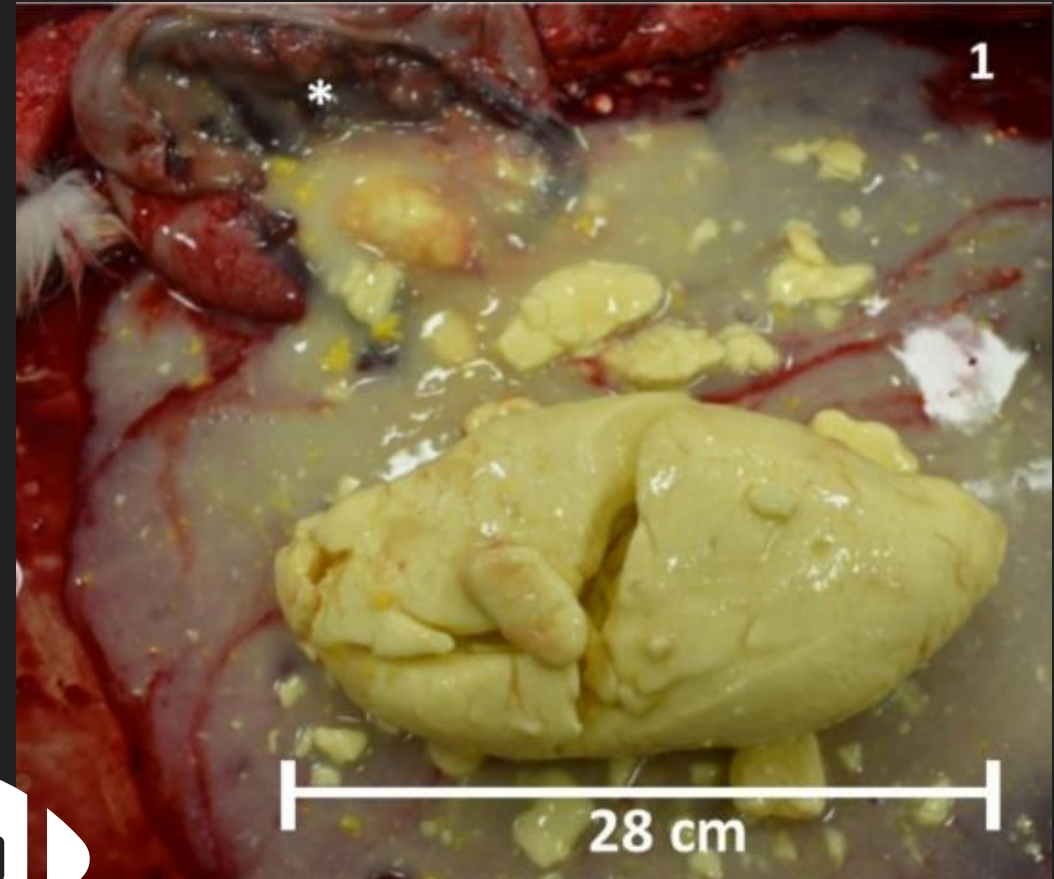
When a Calf Nurses Colostrum



- 1L meals
- Goes directly into the abomasum
- Moves to small intestine where IgG absorption takes place

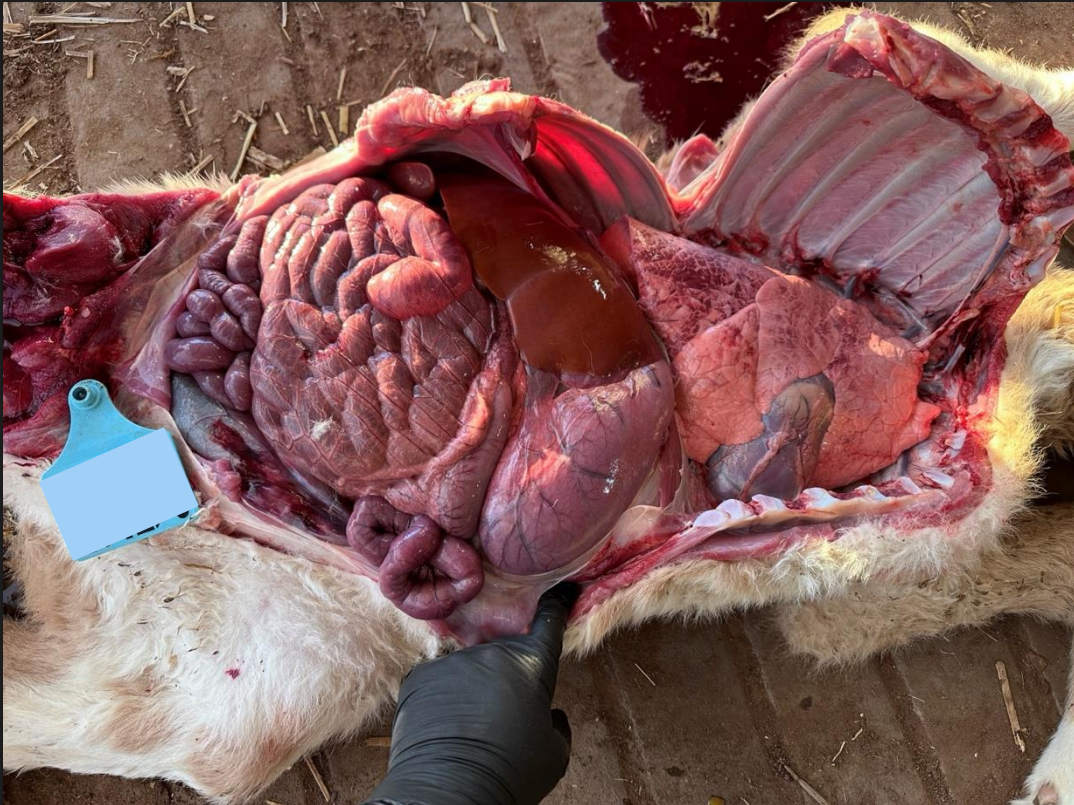
Rethinking Volume of First Feeding

- Holstein heifer, 85 pounds
- First feeding 4L colostrum via tube
- 6 hours later 2L via tube
- Calf presented with signs of colic, distress, pain and do not want to eat



< 24 Hour Old Calf Found Dead

Tubed 4L colostrum at birth, tubed 2L colostrum 12 hours later



Colostrum clot

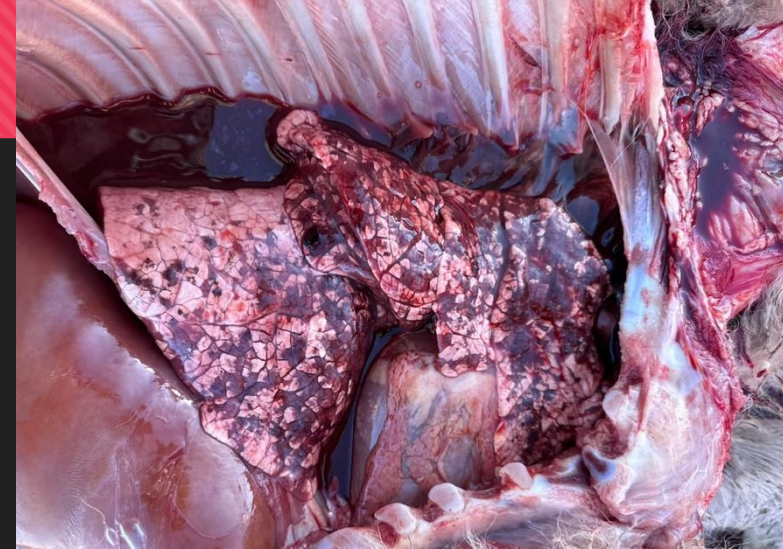
Overtubed Calves Don't Want to Drink



Leads to employee frustration and increased risk of aspiration when training to drink

Risks of Tube Feeding Large Meal of Colostrum

- Regurgitation, aspiration, pneumonia
- Colic, rumenitis, abomasitis, ulcers, acidosis
- Large colostrum clots
 - Pain, discomfort, not digested, increased risk for ulcers
 - IgG's not absorbed because colostrum needs to get to the small intestine for IgG absorption
- Decreased efficiency of IgG absorption – wasting IgG's
- Calves do not want to drink
- Further exacerbated when multiple colostrum meals tubed



Volume given in the first feeding:

4L is too much

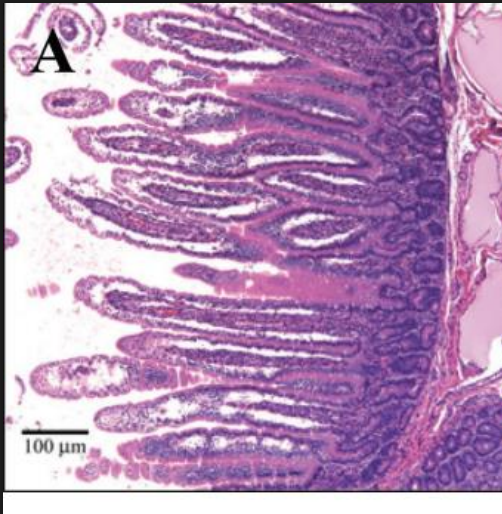
3L for Holsteins and 2L for Jerseys

Continued Feeding of Colostrum Promotes GI Development

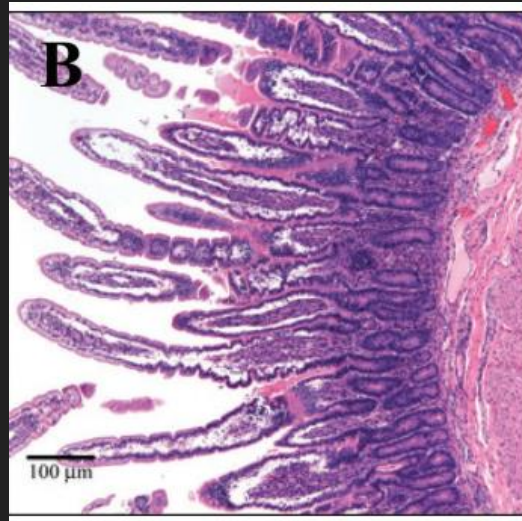


- Holstein bull calves, 3 groups
- All fed 1 meal of colostrum (**7.5% BW**)
- At 12 hours, second meal went into one of the three groups fed at **5% BW 2X day**
 1. Colostrum
 2. 50/50 Colostrum/Milk
 3. Whole Milk
- Killed on day 3 of life

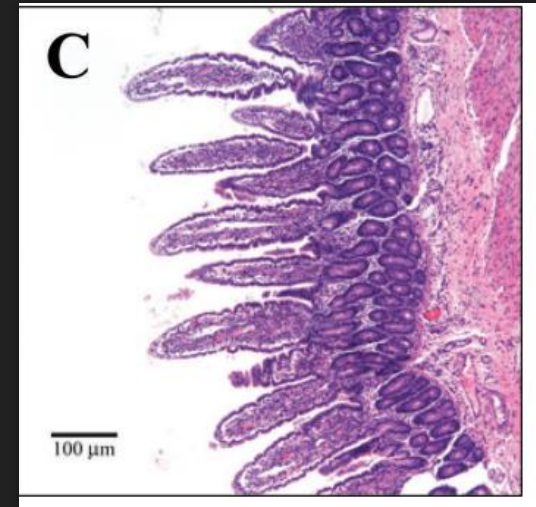
Continued Feeding of Colostrum Promotes GI Development



Colostrum



50/50
Colostrum/Milk



Milk

Calves continued to be fed colostrum or the 50% milk/50% colostrum meals had **increased intestinal villi development** surface area for absorption compared to milk only group

IgG's in this Study

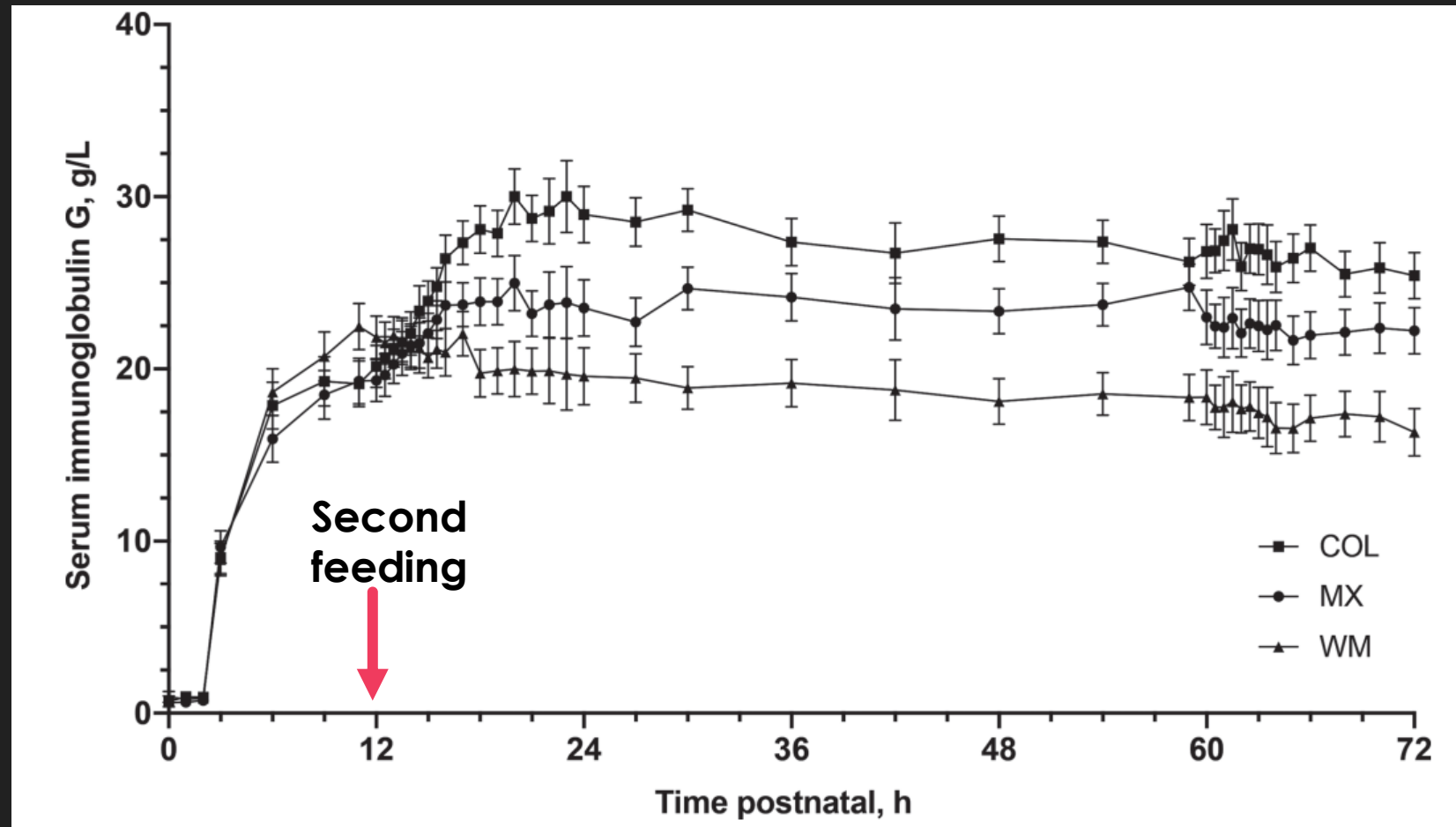
	IgG's in first 2 feedings	Additional IgG's given	Max Serum IgG	Time to Max serum IgG
Colostrum	314g	251g	30.4 g/L	29.5 hours*
50/50 Mix	247g	124g	27.2 g/L	27.0 hours*
Whole Milk	195g	N/A	23.9 g/L	13.4 hours

* No statistical difference

- Feedings started at 12 hours of life was 5% BW (approx. 2L)
- Calves fed every 12 hours until end of study at 3 days old

Benefit to Additional IgG Feeding at 12 hours

- Providing another feeding of IgG's at 12 hours increased serum IgG
- Persistence of IgG's in serum
- IgG's provided after 12 hours did not continue to increase serum IgG



Best Practices for Second Feeding

- 12 hours after first feeding
- Use your 22-24% Brix colostrum
- 2L (Holstein and Jersey)
- If possible, offer via a nipple instead of a tube



Offer a Second Colostrum Feeding:

2L, 12 hours later

Summary

- 300g IgG in the first 24 hours of life
- Accomplished by feeding multiple smaller meals of higher quality colostrum



		Holstein	Jersey
1st feeding	≥25% Brix	3L	2L
2nd feeding	22-24% Brix	2L	2L
2nd feeding is 12 hours after the first feeding, preference is to be offered via nipple			

- 70% of your calves' serum total protein at 48 hours old is ≥ 5.8

QUESTIONS



elizms@gmail.com